REMARKS

Claims

Claims 1-18 are pending in the case at the time of the Office Action. Claims 9 and 17 have been amended to correct typographical errors. Claims 1, 16 and 17 are amended to remove references to air.

Section 103 rejections

Claims 1-18 are rejected as being obvious over a combination of applicant's admissions, US Patent 5,705,564 to Liang ("Liang '564") and US Patent 6,027,557 to Hayner ("Hayner '557"). Applicants traverse the rejection with respect to the claims as follows:

Claim 1

With respect to the Examiner's determination of "admissions" by the applicants, the applicants agree that use of polymer-modified bitumen in a roofing membrane with a fibrous core, a granular top surface and an anti-stick bottom is known in the art. The assignee of the entire interest in this application has indeed produced such roofing membranes for long more than twelve months prior to either this application or the provisional application upon which it depends.

With respect to Liang '564, the Examiner states that Liang '564 teaches the mixing of a polymer modifier with bitumen under vacuum in order to remove air and to prevent decomposition of the modifier, citing Col. 9, lines 20-25 and Col. 10, lines 25-35 and 45-50. This characterization is simply not correct. Close attention is directed to Liang '564. The applicant agrees that Liang '564 teaches "vacuum or inert gases" (Col. 9, line 24) which "may be beneficial in certain instances." In other words, vacuum and inert gases are treated as being equivalent. Likewise, Liang '564, at Col. 10, lines 30-33, teaches that the mixing process may be blanketed with "an inert gas, such as nitrogen." This is done to increase the time and temperature for dispersal of the polymer in the bitumen, "because of the lack of stability of butadienes above about 210° C, especially in air." Col. 10, lines 28-30. This contradicts the Examiner's asserted equivalence of "vacuum" and "inert gases" in Col. 9, at least as to the issue of entrainment, an issue which is not found at all by the applicant in a review of Liang '564. A vacuum will allow out-gassing of entrained gases, which are an almost necessary consequence of vigorous stirring at atmospheric pressure or above. No amount of inert gas, present at a pressure of ambient or above, will allow such out-gassing.

A few last comments about Liang '564 are also in order. Liang '564 does not inherently teach a system in which resultant matrix is characterized as being substantially free of voids. The use of either vacuum or inert gas is mentioned in none of the thirteen examples cited. Liang '564 is best characterized as a teaching of how to stabilize insoluble materials in a continuous non-aqueous phase by reacting the insoluble material in situ with stabilizer compounds, as stated in the abstract.

Hayner '557 not only does not teach any use of vacuum to provide a matrix that is substantially free of voids, it actually teaches blowing air in to the material while it is being mixed, at a pressure greater than atmospheric, rather than under a vacuum (Col. 8, lines 6-8).

While the Examiner states that Liang '564 provides motivation to use a vacuum process, this is not consistent with Liang '564 teaching that an inert gas may be equivalent to a vacuum.

For these reasons, the Examiner has not provided a combination of art that inherently meets all of the requirements of claim 1, that is, "a roofing membrane comprising a continuous matrix of bitumen modified by addition of a polymer, the matrix being characterized as being substantially free of voids." For at least that reason, Claim 1 is allowable over the asserted combination of art.

Claim 2

Claim 2 depends from claim 1, and adds the limitation that "the modifying polymer is selected from a group consisting of: styrene-butadiene-styrene ("SBS") block co-polymer, atactic polypropylene ("APP"), and a combination of SBS and APP."

Applicant admits that Hayner '557 teaches the use of the specific modifying polymers recited in the claim. That, however, does not mean that the claim is obvious over the combination. This is because: 1) neither Liang '564, Hayner '557, nor the combination of them meet the limitations of claim 1 (as set forth above) and 2) even if they did, there is no motivation to combine the teachings of Liang '564 with those of Hayner '557, apart from the hindsight of reviewing the applicant's disclosure. For at least these reasons, claim 2 is allowable even if claim 1 is not.

Claim 3

Claim 3 depends from claim 1, and adds the limitation that "the bitumen is selected from the group consisting of straight run asphalts with a rod & ball softening point in the range of

from 80 to 130 degrees F; oxidized asphalts, solvent washed asphalts, road tars, refined tars, and blends thereof."

Liang '564 admittedly teaches products in the scope of this limitation, without even involving Hayner '557. However, neither Liang '564, Hayner '557, nor the combination of them meet the limitations of claim 1 (as set forth above). This claim rises or falls with claim 1, but claim 1 is considered allowable.

Claims 4 and 5

Claims 4 and 5 each depend from claim 1. Claim 4 adds the limitation that "the bitumen is modified by the polymer by adding the polymer to the bitumen while the bitumen is in a molten state in a sealed mixing vessel at a pressure inside the vessel of less than ambient" and claim 5 adds the limitation that "the bitumen is modified by the polymer by adding the polymer to the bitumen while the bitumen is in a molten state until the polymer is completely dispersed in the bitumen, followed by residence of the modified bitumen in a sealed vessel at a pressure inside the vessel of less than ambient." Because these limitations are closely related, they are treated together.

The critical element of each claim is the vacuum treatment of the modified bitumen, whether it occurs during dispersal (claim 4) or after (claim 5) of the modifying polymer. As noted above, Liang '564 teaches that vacuum and inert gas are equivalent for its purposes, so it does not meet the limitation. Hayner '557 directly teaches away by suggesting blowing air into the mixture. Therefore, claims 4 and 5 are each allowable because: 1) neither Liang '564, Hayner '557, nor the combination of them meet the limitations of claim 1 (as set forth above), 2) even if they did, there is no motivation to combine the teachings of Liang '564 with those of Hayner '557, apart from the hindsight of reviewing the applicant's disclosure; and 3) the limitations of claims 4 and 5 are not met by Liang '564 and Hayner '557, even if properly combined. For at least these reasons, claims 4 and 5 are independently allowable even if claim 1 is not.

Claims 6 and 7

Claims 6 and 7 are identical, except that claim 6 depends from claim 4 and claim 7 depends from claim 5. Each adds the limitation that "the internal pressure in the vessel is at least 15 inches Mercury less than ambient." Because these limitations are closely related, they are treated together.

The critical element of each claim is the amount of minimum vacuum used. Liang '564 makes only a passing reference to the vacuum and does not ever directly teach the minimum amount needed, and the teaching that vacuum and inert gas are equivalent for its purposes would indicate that the amount is not important. Hayner '557 directly teaches away by not even suggesting a vacuum. Therefore, claims 6 and 7 are each allowable because: 1) neither Liang '564, Hayner '557, nor the combination of them meet the limitations of claim 1 (as set forth above), 2) even if they did, there is no motivation to combine the teachings of Liang '564 with those of Hayner '557, apart from the hindsight of reviewing the applicant's disclosure; 3) the limitations of claims 4 and 5 are not met by Liang '564 and Hayner '557 (as argued above), even if properly combined, and 4) the limitation of claim 6 and 7 are not met by Liang '564 and Hayner '557 (as argued above), even if properly combined. For at least these reasons, claim 6 and 7 are independently allowable even if claim 1 and either claim 4 or claim 5 are not.

Claims 8 through 13

Claims 8 through 13 ultimately depend from claim 1, and add limitations that "the modified bitumen continuous matrix embeds a reinforcing mat of fibers" (claim 8), that "an upper or weathering surface of the membrane is coated with a granular material" (claim 9), that "the granular material [of claim 9] is a No. 11 ceramic roofing granule" (claim 10), that "a lower or non-weathering surface of the membrane is coated with a means for preventing self-adhesion" (claim 11), that "the means for preventing self-adhesion [of claim 11] is a fine silica sand" (claim 12), and that "the modifying polymer is present in the modified bitumen in the range of from about 5 to about 30 percent by weight" (claim 13).

These limitations are all part of the known prior art, as admitted by the applicants. These claims rise or fall with claim 1. However, neither the applicant's admissions, Liang '564, Hayner '557, nor the combination of them meet the limitations of claim 1 (as set forth above). Since claim 1 is allowable, these claims are considered allowable.

Claim 14

Claim 14 depends from claim 2, and adds the limitation that "the bitumen is further modified by a secondary modifying polymer selected from the group consisting of styrene-isoprene styrene ("SIS"), styrene-ethylene-butylene-styrene ("SEBS"), styrene-ethylene ("SE") and combinations thereof."

Applicant admits that Hayner '557 teaches the use of the specific modifying polymers recited in the claim. That, however, does not mean that the claim is obvious over the combination. This is because: 1) neither Liang '564, Hayner '557, nor the combination of them meet the limitations of either claim 1 or claim 2 (as set forth above) and 2) even if they did, there is no motivation to combine the teachings of Liang '564 with those of Hayner '557, apart from the hindsight of reviewing the applicant's disclosure. Although claim 14 rises or falls with claim 2, it is allowable even if claim 1 is not.

Claim 15

Claim 15 depends from claim 5. It adds the limitation that "the modifying polymer is added to the bitumen while the bitumen is agitated in a mixer at a temperature in the range of from about 300 to about 400 degrees Fahrenheit" to the prior requirement that a residence time under vacuum be used subsequent to adding the polymer.

The temperature range for adding modifying polymers to bitumen are known in the industry, so this claim rises or falls with claim 5. However, claim 5 is considered allowable for the reasons set forth above, so this claim is also considered allowable if claim 5 is allowable.

Claim 16

Claim 16 depends from claim 1, and adds the limitation that "the roofing membrane exhibits no blistering from entrained voids after being submerged in water at about 120 degrees F for 72 hours, then maintained at about 160 degrees F under at least 15 in. Hg vacuum for up to 48 hours."

This claim further describes the property of being free from entrained voids. Since neither Liang '564 nor Hayner '557 either implicitly or explicitly teach a product free from entrained voids, neither (nor their combination) meets this limitation. For at least these reasons, claim 16 is allowable even if claim 1 is not.

Claim 17

Claim 17 is an independent claim that incorporates the individual limitations of claims 1 ("a continuous matrix of bitumen modified by addition of a polymer, the matrix being characterized as being substantially free of voids"), claim 2("the modifying polymer being selected from a group consisting of: styrene-butadiene-styrene ("SBS") block co-polymer, atactic polypropylene ("APP"), and a combination of SBS and APP"), claim 3 ("the bitumen being selected from the group consisting of straight run asphalts with a rod & ball softening point

in the range of from 80 to 130 degrees F; oxidized asphalts, solvent washed asphalts, road tars, refined tars, and blends thereof"), claim 15 ("the bitumen is modified by the polymer by adding the polymer to the bitumen while the bitumen is in a molten state in a sealed mixing vessel where the bitumen is agitated at a temperature in the range of from about 300 to about 400 degrees Fahrenheit"), claims 4 or 5 ("the modified bitumen is exposed to a pressure during modification or after modification while still in a molten state of less than ambient, the pressure being at least 15 inches Hg less than ambient"), claim 8 ("a reinforcing mat of fibers is embedded in the matrix"), claim 9 ("an upper or weathering surface of the membrane is coated with a granular material"), claim 11 ("a lower or non-weathering surface of the membrane is coated with a means for preventing self-adhesion"), claim 13 ("the modifying polymer is present in the modified bitumen in the range of from about 5 to about 30 percent by weight") and claim 14 ("the bitumen is further modified by a secondary modifying polymer selected from the group consisting of styrene-isoprene styrene ("SIS"), styrene-ethylene-butylene-styrene ("SEBS"), styrene-ethylene ("SE") and combinations thereof").

This claim rises or falls on ots own, but should be allowable for the reason that claim 1 is allowable, as well as the reason that the other limitations are allowable, as described in further detail above with regard to those claims.

Claim 18

Claim 18 is an independent claim directed to a process for providing a roofing membrane. While applicant will admit that certain steps in the process are known in the art ("providing a bitumen being selected from the group consisting of straight run asphalts with a rod & ball softening point in the range of from 80 to 130 degrees F; oxidized asphalts, solvent washed asphalts, road tars, refined tars, and blends thereof", "providing a modifying polymer being selected from a group consisting of: styrene-butadiene-styrene ("SBS") block co-polymer, atactic polypropylene ("APP"), and a combination of SBS and APP", "modifying the bitumen by adding the modifying polymer to the bitumen while the bitumen is in a molten state in a sealed mixing vessel where the bitumen is agitated at a temperature in the range of from about 300 to about 400 degrees Fahrenheit", and "forming the roofing membrane from the molten modified bitumen"), applicant does not admit that the step of "exposing the modified bitumen to a pressure less than ambient during or after modification while still in a molten state to allow release of

entrained gases" is taught or obvious in view of any of the prior art references, so claim 18 is allowable, regardless of the allowability of any of claims 1-17.

The Examiner's Office Action having been carefully considered and all points addressed, prompt reconsideration and allowance of the claims is now respectfully requested.

Respectfully submitted,

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